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Playing with data and its consequences

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Abstract

The fundamental paradigm shift brought about by datafication alters how people participate as citizens on a daily basis. "Big data" has come to constitute a new terrain of engagement, which brings organized collective action, communicative practices and data infrastructure into a fruitful dialogue. While scholarship is progressively acknowledging the emergence of bottom-up data practices, to date no research has explored the influence of these practices on the activists themselves. Leveraging the disciplines of critical data and social movement studies, this paper explores "proactive data activism", using, producing and/or appropriating data for social change, and examines its biographical, political, tactical and epistemological consequences. Approaching engagement with data as practice, this study focuses on the social contexts in which data are produced, consumed and circulated, and analyzes how tactics, skills and emotions of individuals evolve in interplay with data. Through content and co-occurrence analysis of semi-structured practitioner interviews (*N*=20), the article shows how the employment of data and data infrastructure in activism fundamentally transforms the way activists go about changing the world.

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Introduction

The array of information and informational infrastructure that goes under the label of "big data" increasingly defines our political and economic citizenship. Datafication has altered the conditions under which people participate in public life. It has expanded the avenues and the repertoire of citizens' contributions to collective decision-making: think for example of the opportunities for advocacy unlocked by "open data" released by public administrations. Data, regardless of their magnitude, have come to constitute a new terrain of engagement — one that has the potential to bring collective action, communicative practices and digital infrastructure into a fruitful dialogue.

Citizens, activists and professionals alike embrace innovative data-related practices at the intersection of the digital and the informational, embedding data and ways of playing with data in their activities. Following in the footsteps of "pre-big data" informational activism embodied by Anonymous and WikiLeaks, today individuals and groups crowd-source data for mapping purposes, use data for journalistic reporting, and gather data to support their campaigning efforts. Scholars have gradually devoted their attention to these emerging forms of engagement with data — from data journalism (*e.g.*, Baack, 2018) to democratic participation (Couldry and Powell, 2014), from aid and development (*e.g.*, Dalton, *et al.*, 2016) to research (*e.g.*, Brooks, *et al.*, 2016). How individuals make sense of the data and their fabric is also becoming an object of academic inquiry (see, for example, Kennedy, *et al.*, 2016; Lupton, 2018). However, little has been said about the influence of these practices on social actors themselves. Bringing the disciplines of critical data studies (CDS) and social movement studies (SMS) into dialogue, this paper explores the individual dimension of engagement with data to put to the test the widespread assumption that "big data" change many aspects of social life. Specifically, it analyzes the outcomes of engaging with data, asking how

exposure to data transforms strategies, careers, even worldviews of those who embrace them in their everyday practices. It so does by analyzing a set of in-depth interviews with 20 individuals whose daily activities recursively intersect data and data analysis.

We see popular engagement with data as data activism, an umbrella term that embraces various practices at the crossroad of the social and the technical, which take and/or promote a critical approach to datafication. Data activism "addresses the politics of big data (...) It calls into question the overall epistemology of big data, and interrogates our way of making sense of the 'political' in relation to information — but also our ways of understanding development, change, and the relation between individuals and society" [1]. Forms of affirmative engagement with data are to be ascribed to the sub-category of "proactive data activism," which emphasizes the ability of activists to take advantage of the possibilities for advocacy and social change offered by data and data analysis software. As we illustrated elsewhere (Milan and Gutiérrez, 2015), proactive data activism emerges at the crossroads of advocacy and campaigning, citizen's media, and investigative journalism. Examples include DataKind, mobilizing data analysis skills for civil society organizations, and the InfoAmazonia network of environmental journalists and activists promoting data transparency in the Amazonian region (Gutiérrez, 2018a).

To understand how proactive data activism works in practice, we expose emotions and ways of making sense of working with data as well as the facilitator role of databases and algorithms. We thus contribute to the understanding of how data activism matters, both for practitioners — the "vanguard" of proactive data activism — and their immediate audiences. Understanding how playing with data transforms practitioners allows us also to reflect on the evolution of contemporary digital activism, as data activism, "bearer and interpreter of technological innovation", represents "the new frontier of media activism" [2].

In what follows, we first present our conceptual toolkit and methods. We then explore the consequences of working with data for social causes, offering a typology of people's perceptions of the effects of engaging with data. Finally, we reflect on the implications of data activism for present-day digital activism.

Dealing with datafication: A conceptual toolbox

How can we talk about what people do with data? Here we offer a cross-disciplinary conceptual toolbox touching upon five aspects: data, data infrastructure, data subjects, data practices and their consequences. We draw extensively on two disciplines of sociological nature, namely CDS and SMS, for their ability to illuminate the realm of critical practices on the one hand and, on the other, the meaning-making activities of individuals and groups advocating for change. This section explains what we mean by data and data infrastructure, and presents our approach to actors, their practices, and outcomes of social action.

In their crudest form, data equal information, and information equals power (Innis, 1986; Castells, 2009). With the advent of "big data" and machine learning, information is increasingly quantified, monetized, and automatically generated and processed. But data are not neutral. They are "something fashioned" and deeply political, resulting from processes of power and control (Boellstorff, 2013). In a datafied social order, whoever controls these data flows processes controls a considerable part of society. While the private sector harvests data for improving service delivery but also for what O'Neil (2016) calls "predatory advertising", progressive activists leverage information and technology to generate stories, evidence, awareness, mobilization and ultimately social change. In the eyes of these actors, data and their technologies equate McLuhanian extensions (McLuhan, 1994), which allow them to do things they could not do before. For example, in the past land-rights activists have remapped land using kites, balloons and analogue photography; now, with aerial, high-resolution pictures supplied by drones and satellites, they can produce better evidence able to withstand close scrutiny [3].

Data are a cultural resource that needs to be made and interpreted, since "'raw data' is an oxymoron" [4]. We consider data as a technology, going back to the ancient Greek noun *techne*, indicating the "human ability to make and perform" [5] or the craft or "making" shared by the fields of art and engineering [6]. In other words, we are interested in the practices of engagement with data, rather than in data *per se*. Focusing on what people can do with data, rather than data magnitude, we emphasize the transformative potential of data and stress the capacity for human agency to emerge in interaction with novel data practices.

Data do not exist in a vacuum but are entrenched in a plethora of novel or revamped "data infrastructures", that is to say, the software and hardware enabling people to obtain, store, curate, analyze, transmit and represent data utilizing algorithmic logics. However, infrastructures are no unbiased "pipes". Rather, they are variably complex, multifaceted socio-technical systems embedded within institutions and their politics. They are framed by and grounded in socio-technical regimes, industrial practices, technological artefacts, political agendas and ideologies (Kitchin and Lauriault, 2014), which result in architectural choices that are often "structurally limiting to users" (Zelenkauskaite, 2017). These data infrastructures produce new spaces and operations of power through practices of classification, measurement and comparison, and contribute to generating new social practices, new problematizations of the social, and new forms of governance (Gulson, *et al.*, 2015). Despite these limitations, data infrastructure embeds manifold opportunities for engagement and subversion, which data seek to seize to advance their progressive agendas.

How can we make sense of the data subjects emerging in interaction with data infrastructure? The social actors interviewed in this study form part of pioneering communities contributing "to our understanding of changes" in knowledge production and the associated social and cultural transformations [7]. Pioneering communities "possess a marked sense of mission" and develop ideas of change "that can provide orientation for broader social discourses" [8]. They act as intermediaries between the development and the appropriation of technologies [9], "expanding the learning public" [10]. They represent the *avant-garde* of data activism for they pioneer the exploitation of data infrastructure as a catalyst for social action. Their use of technology "creates a horizon of possibility to which the everyday media appropriation of others orients itself" [11]. Nonetheless, these communities may occasionally embed and contribute to perpetuating power asymmetries within the citizenry, as they are typically constituted by educated "experts" with access to resources (*cf.*, Zelenkauskaite and Bucy, 2016).

We approach data activism as a media practice, asking "*what are people (...) doing in relation to [data]* across a whole range of situations and contexts? How is people's [data]-related practice related, in turn, to their wider agency?" [12]. We reflect on how people act on data infrastructure, looking at the social processes enacted by individuals in and through their engagement with data "to build and sustain meaningful political engagement" [13]. Looking at novel ways of "acting on" datafication, we focus on people's ability to develop political subjectivity and promote alternative epistemologies, contributing long-term norm change.

To understand the consequences of engaging with data, inspired by SMS literature, we distinguish between cultural (*e.g.*, Rochon, 1998; Earl, 2004), political (*e.g.*, Amenta, *et al.*, 2010), and biographical consequences of activism (Giugni, 2004; Vestergren, *et al.*, 2017). While scholarship so far has concentrated almost exclusively on the national level (with few exceptions, see *e.g.*, Earl, 2016) and on a movement's impact in relation to its stated agendas, we look for *unintended consequences* on individuals — that is, the byproduct of engaging with data. In other words, we explore how data activism matters beyond the activist outlined social-change agenda (*cf.*, Tilly, 1999; Bosi and Uba, 2009). Of interest are the "effects on the life-course of individuals" participating in data activism, to the extent they are "at least in part due to involvement in those activities" [14]. We ask "do [data practices] change the life choices of those participating in protest activities" or advocacy and humanitarianism? [15]. We are also interested in identifying changes in culture and in the social norms in which data activists intervene, in connection to the emergence of alternative epistemologies rooted in grassroots data practices (Milan and van der Velden, 2016).

Methodological notes

Twenty semi-structured interviews were conducted with journalists, data scientists and analysts, software developers and researchers. Most interviewees deal with "small data" resulting from the analysis of "big data", or "good enough data," that is to say "citizen data" sufficient to provide "ways of realizing environmental and social justice" [16]. Following a criterion sampling approach (Patton, 2014), they have been selected for their intensive exposure to data and data infrastructures (henceforth, data/infrastructure). Interviewees (indicated in the text with a progressive number, see Table 1) i) depend on data infrastructure for their everyday work; ii) define themselves in relation to their engagement with data/infrastructure (*e.g.*, as data journalists, data activists or data scientists); and iii) use data analysis and visualization for political or social goals. This purposive sampling aims at capturing what highly-skilled practitioners — the "pioneers"

of data activism — believe they do, how they see and employ data infrastructure, and how understandings and tactics evolve. Our analysis targets the micro-sociological level, with occasional excursions to the organizational level. The interview questionnaire included questions such as: Take me back through the history of your organization. What do you consider being the biggest successes of your project? Why do you think it succeeded? How about growth potential? The interviews were complemented by extensive participant observation at data-related workshops across Europe and the Americas (2013–18).

Our sample comprises individuals aged 30–59 at the time of the interview, with a slight majority of Caucasian males. They are highly educated although their formal education might not correspond to their current field of engagement. Given their skills and pioneering ethos, our interviewees are no ordinary users. Yet, their experiences show how people can "learn [...] from the ground up" [17], as most interviewees belong to the third sector and often their data and analyses of social problems inductively emerge from the grassroots. Furthermore, approaching pioneers who have the skills to problematize and politicize technological development, allows us to understand "who has the capacity, resources, expertise and interest to act on" data today [18].

Table 1: Interview list (adapted from Gutiérrez, 2018a).

Interviewee	Description position
Interviewee 1	Director of an international human rights organization; long-time activist
Interviewee 2	Director and co-founder of an organization that creates platforms, maps and tool to visualize data for social causes; engineer
Interviewee 3	Investigative, data journalist; has coordinated and strategized the joint analysis and publication of several massive data leaks
Interviewee 4	Data visualization expert, Professor of Communication and author; has published a book of reference on data visualizations; technical background
Interviewee 5	Journalist and author; uses data-based maps in his work
Interviewee 6	Data Journalist, co-founder of an award-winning organization that visualizes data on climate and social causes; has acquired technical expertise over time
Interviewee 7	Social networks data analyst and a researcher at a university; she is an engineer
Interviewee 8	Founding director of research center on media studies, and well-known author on media studies
Interviewee 9	Founder of an organization that mixes the Internet of Things, participative design, data and art and architecture
Interviewee 10	Well-known philosophy author, Professor of Political and Social Philosophy; founding director of a research center focused on globalization; often writes about datafication and data infrastructure
Interviewee 11	Chief product officer and founder of an award-winning organization dedicated to interactive cartography and data analysis; engineer
Interviewee 12	Chief executive officer of an award-winning organization devoted to interactive mapping on environmental issues; studied biology

Interviewee 13	Public budget expert, strategist, co-founder of an organization dedicated to visualizing data and budget transparency
Interviewee 14	Researcher and expert on open data
Interviewee 15	General manager of an organization specialized in transferring skills from data scientists into social organizations and causes
Interviewee 16	Director of an organization focused on donor transparency
Interviewee 17	Journalist, author and director of a university postgraduate program on communication, culture and digital citizenship
Interviewee 18	Epidemiologist, researcher, activist and medical assistant manager of a hospital; employs massive data in his work
Interviewee 19	Researcher and author of a guidebook for incorporating big data into humanitarian operations
Interviewee 20	Researcher and team leader of a group of researchers dedicated to environmental and development issues; employs data analysis and visualizations in her work

The consequences of proactive data activism

How are data practices changing activists themselves, their tactics, vision of the world and lives, ultimately shaping data activism as it unfolds? We argue that exposure to data/infrastructure instigates transformations of six kinds: i) work-life (*i.e.*, career and professional trajectories); ii) identities (how do individuals view themselves and their role in society); iii) tactics and tools (*i.e.*, the ways they make arguments); iv) epistemologies (*i.e.*, their vision of the world); v) self-empowerment, and vi) empowerment of others. These are largely "subjective", self-reported changes, as opposed to "objective", *i.e.*, verifiable and "measurable by an observer" [19]. The six can be subsumed in three larger categories: biographical, cultural and political, described in what follows.

Work-life: Enabling and hybridization

Changes in individual biographies and careers are found at the intersection of emotional engagement with data (Kennedy and Hill, 2018), personal motivation and skills acquisition. Over half of our interviewees have experienced a significant changeover when working with data. An engineer explained that entering the area of data and development made him realize he was dissatisfied with for-profit work: he later decided to dedicate himself to policy advocacy concerning data transparency (2). Other two felt "compelled to" go into activism, one by "the lack of data transparency and access" hampering her work as a journalist (3), and the other by the high "level of opacity regarding (data) access for citizens" (13). Our data indicate that negative emotions such as frustration can turn to gratification when individuals resort to data activism.

There appears to be a connection between personal motivation and individual turnaround and self-realization. Changes in career paths towards engaging with "things that matter" (2) appear to be driven by a growing awareness of the power dynamics behind data/infrastructure, which compels activists to use them for "good" causes, and by the desire "to give back", putting their skills at the service of social causes (15). In several cases, exposure to the opportunities offered by big data has reignited pre-existing attitudes to political involvement: individuals have reportedly changed their career when they (re-)discovered social causes through data activism (2, 3, 13). An epistemologist reported that collecting data in Sierra Leone

during the Ebola crisis made him more inclined to "try to change things around me through the medical profession and the use of creativity" (18).

Skill acquisition — the techne dimension of data — is at the heart of career change. Creative work with data/infrastructure can generate job opportunities also at managerial level, especially for those already reasonably tech-savvy like engineers (11, 7). Individuals in the non-profit sector report to have been somehow "forced" to acquire data skills to advance their advocacy demands such as data openness (1, 6, 15, 16). These findings are in line with earlier research showing how subjects are found to be more educated following participation in activism (Sherkat and Blocker, 1997).

Professions that were separated before, such as advocacy and journalism, now invade each other's territories (4). All interviewees reported transitioning towards hybrid professional profiles — but this transition has not always been smooth. The economic viability of data projects remains a challenge, and mixed profiles still find little resonance in the slowly-adapting job market. The reasons are manifold. For example, non-profits tend to be slower at absorbing data analysts in comparison with for-profit enterprises (15). Yet, civil society organizations are filling a gap by responding to the slow adoption of data journalism practices by newsrooms (3). Academia, too, tends to silo disciplines, but "under the pressure of events and the invitation of opportunities, a lot of people are beginning to jump over those walls, and even break them down" (8, 17). But there is no business model for innovative projects (9) and funding for data projects, especially in the case of protracted crises like natural disasters, remains a challenge. Taking action, then, becomes paramount. One interviewee, for example, co-authored a guidebook to "convince decision-makers of the value of utilizing big data," and to "instill a sense of urgency about how it is an inevitable future of humanitarian operations" (19).

Identity: Tension and evolution

The acquisition of new skills, motivations and interests results in the transformation of the sense of self. Self-definition is particularly relevant for a type of activism in its infancy, such as data activism. Two questions arise: when do people start calling themselves data activists? Does a collective identity emerge, and if so, when and how?

About half of our interviewees outright self-define as data activists; others recognize themselves in the category when prompted to reflect upon it. A biologist turned environmental campaigner explained how "I must have been a data activist all along without knowing it" (12). Exposure to data/infrastructure and the possibilities for transformation it opens up are the main triggers in this evolution, and new identities follow rather than precede exposure to data/infrastructure. "New" identities are welcomed with a mix of excitement for the novel imaginaries and possibilities they embody and dissatisfaction at the slow pace at which "the world takes notice" (2). Others find it harder to characterize what they do, due to skill hybridization. The creator of a data-based, participatory architecture housing project reported having to juggle the "tension" between users and designers: "We are not a design agency that has clients who commission us to solve a problem. We are no artists that (...) develop ideas and then look for commissions. And we are not simply technologists that create a product and unleash it upon the world" (9). A journalist turned data activist reports her vision of the world and her understanding of journalism were fundamentally altered for the better: "My goals have changed" (3). She discovered that journalism is not the aseptic practice that she was taught at a U.S. university, but a muddier territory where one has to fight for her right to information. Predictably, data journalists are particularly open to the hybridization of identities (*cf.*, Baack, 2018). They tend to concur that "separating data journalism from data activism risks creating a false dichotomy (...) The underlying rationale of informing and changing remains the same" (14) and "there is no hard-and-fast line dividing journalism, campaigning and activism (...) No journalism is value-free, though there is a big difference between true campaigning journalism and more objective reporting" (6).

Our fieldwork notes identify many slogans referring to new, positive and empowering identities, such as "make data love", "join the data revolution", or "hacking innovation". These contribute to creating a sense of collective identity and a process of identification. But when does individual self-identification turn into a shared identity? Collective identity lies in the intersubjective process of making sense of acting together (that is, in the same field of action) resulting from the "network of active relationships between actors" [20]. In our sample, several artefacts (*i.e.*, projects and organizations), as well as common discourses and imaginaries, point to the emergence of a collective identity as the outcome of acting on data/infrastructure. However, similarly to the nature of activism itself, this emerging identity is plural, hybrid and multifaceted and, rather than preceding action, follows it. Contrary to earlier research on collective identity in consolidated movements (*e.g.*, Polletta and Jasper, 2001; McDonald, 2002), here shared values emerge

contextually with action. A collective identity builds on the metaphors — ways of thinking about the invisible when it generates visible consequences (Chun, 2011) — embodied in data/infrastructure. Normative metaphors of "big data" (*e.g.*, information as power or data as open) are the building blocks of the data-activist collective identity. Such identity is assembled around "expert" elements harboring specific socio-cultural forms and practices after which actors can model sociality.

Overall, our interviews show how data activism carries its own specific yet composite identity, based on the data-inspired evolution of other identities such as the advocate and the journalist. It is expected that, as data activism expands as a pioneering community to other sectors of the civil society, collective identities may become more explicit.

Tactics and tools: New languages of engagement

"Statistics are no longer the realm of a few gurus," argued an epidemiologist. "Big data" are "changing life in many ways (...) from checking traffic jams via Google Maps to looking at the new health trends analyzing Internet searches and being able to predict a new flu outbreak" (18). But as data and data science become "democratized", data management and reuse demand a novel "sense of sharing, community and access" (Brooks, *et al.*, 2016). How do tactics and tools evolve in response to data/infrastructure? Our analysis reveals significant changes in people's action repertoires and an increased hybridization of said tactics (Gutiérrez, *et al.*, 2018). Specifically, we identified a propensity towards collaboration and interest in developing engaging ways of communicating complex information.

Action repertoires have expanded, with data and data analysis tools taking to the driver seat. "Crowdsourcing (citizen) data" emerges as the innovative approach challenging established mechanisms for evidence verification (12). An investigative journalism organization now approaches datasets without prior research questions, "letting the data tell the story," as "there is a lot of potential in throwing the problem into the machine and seeing what it tells you" (3).

Hybridization of tactics and approaches blurs lines in many fields. As interactive cartography becomes a new paradigm in activism and journalism (Gutiérrez, 2018b), a journalist is pioneering "comics journalism" using maps to present his findings (5). The ability to crowdsource personal data and support individual calls for help during crises is changing the rules of digital humanitarianism, too (*cf.*, Meier, 2015): "As we see longer and more expensive crises, the Standard Operating Procedures are becoming antiquated. It is a challenge for humanitarian organizations to alter their structure to accommodate these changes" (19).

The emergence of novel alliances between distinct professional figures seeking to complement their skill-set is a recurrent theme. Organizations that did not partner easily before must do so now to face the growing complexity, argued a philosopher (10). For instance, data journalists and activists can support each other, because while the former can convert data into stories, often she cannot turn them into policy recommendations or social mobilization. "Collecting data and evidence on a problem is campaigning. Journalists can support that. They complement one another. If you can persuade a good journalist to follow an issue for a while and take your data, it is like gold dust" for activists (16). New types of organizations emerge, too. A Spanish organization fighting for transparency and access to public data was from the start "set up as a multidisciplinary team made of programmers, journalists and communications specialists, joining forces" (3).

Novel distributed networks of data analysts mirror the distributed nature of data infrastructure itself. The involvement of a network of local researchers able to maximize the "chirurgical properties" of data infrastructure, for example, resulted in novel "systems and approaches that, if we get a 'go' signal, we could deploy anywhere if we had the funding", turning isolated local efforts into a "country-level campaign" (20). For a journalist, "history changed" in 2013 when her team was the recipient of the first ever big data leak on offshore and money laundering deals. It took the cooperation of 170 journalists in 50 countries to make sense of it (3). Three years later, another story required the collaboration of over 370 journalists from 76 countries who processed over 11.5 million documents. For another journalist in our sample, "increasingly a journalist is a designer of collaborative projects" mixing different skills, perspectives and tools, which determine the success of a product (5).

Hybridization of skills and methods can result in the generation of new challenges or new ways of looking at a problem, since "what matters is that the tools are put at the service of rigor, search, ethics, honesty and the impossible truth" (5). There is "no clear dividing line between (...) data-based practices: for example, in the future journalistic visualizations might be displayed at museums" (6). Architecture, too, has opened to

new approaches with the advent of big data, whereby the "occupants of spaces (...) take an active role in designing and configuring, determining and specifying what their space or environment is" (9). Visualizing complex issues such as climate change was pioneered in 2013 by an organization founded by a journalist and a mathematician: "people were already practicing both, but separately", with the result that "lots of visualizations and interactive features were very beautiful, but too many didn't tell an interesting story, so failed to engage the audience" (6).

Software-based innovation in how knowledge is communicated leads to the emergence of what we call "languages of engagement", one of the main cultural consequences of playing with data. Languages of engagement forge fresh, cross-disciplinary approaches and (software) tools for communicating with and engage bystanders. Maps have become a key ingredient in the language of engagement of data activists: mixing cartography with crowdsourced and satellite or sensor data, for instance, has taken center stage in campaigning (15, 20). A journalist who told the story of the economic crisis in Spain explained: "Although the center of the project is a book, we must not be naïve: the ability a mere book has to change things in the twenty-first century is very small. So we went for the Web site, with its interactive map, research sources, scanned sketchpad and didactic proposals" (5). The advantage of "the universal language of beautiful images" and visualizations is their ability to speak to broader and more diverse audiences (4).

Generating impact is at the core of these new languages of engagement. The impact is higher because "the information can be gathered and analyzed a lot faster now with these tools. You can scrape government contracts and visualize them, instead of producing a two-year study. The study is still needed, but an interactive visualization has added value and can make the report more accessible to non-experts" (16). An environment specialist analyzing data on fossil fuel subsidies explained how before data visualization tools, "you did a report, and you put it out, and you might get some media coverage": impact was a sort of by-product (20). Today data analysis and visualization afford better and more immediate ways to communicate information, so it is "more alive," while technology offers new ways to channel findings towards the right audiences. Previously, researchers wrote "executive summaries" and "it was much more about slogans and branding." Today it is all about evidence and visualizing data to make "data analysis something people can understand" (20).

The creation of new languages of engagement positions data activists as a "community of critical thinkers who have developed a sensibility to some problem" [21] and can mediate between the possibilities of big data and the general audience. The importance of this "critical community" for the present social movement ecology is found in its effort to "seek acceptance of a new conceptualization of a problem — they want to make sure that other people 'get it' (...) they attempt to influence the conceptual framework used to think about a cluster of issues" [22].

Summarizing, playing with data triggers changes in the activists' repertoires of action, generates hybridization of tactics and unprecedented collaborations to overcome the challenge of vast datasets. Most importantly, it produces new languages of engagement geared to maximize the impact of data advocacy on the society at large, where data activists perform the role of a critical community able to bridge the gulf between people and the "data revolution".

Epistemologies: Novel ways of knowing to fix cognitive failures

The "data-intensive exploration" of big data analytics points to "the emergence of a new (...) paradigm" [23] exploiting data analysis to produce novel visions of the world. The ability to use (near) real-time data and produce analysis speedily, together with the capacity to include ever vaster amounts of data, are changing paradigms in fields as diverse as biodiversity conservation, architecture and human rights campaigning. A closer look at the grassroots data practices of our interviewees points to fundamental changes in "how knowledge is produced" [24], showing how engaging with data/infrastructure results in novel epistemologies emerging from the ground up (Milan and van der Velden, 2016). According to our interviewees, by promoting greater knowledge of the state output and a fine-tuning of the tools of governance, these novel epistemologies can help address the "cognitive failures" of modern democracies (10).

Exposure to data/infrastructure changes how arguments are made, also in the third sector. The type of evidence and outputs campaigning generates has evolved: "Data are powerful weapons that serve to render visible social issues based on facts, rather than conjecture" (7). "Narrative-driven campaigns tend to be more emotional while data-driven campaigns make it harder to avoid difficult realities and facts," explained the co-founder of an organization visualizing climate data (6). This new way of rationalizing can have far-reaching consequences, for better or for worse: "As campaigners have become more data-focused,

sometimes that leads to changes in perspective and the emergence of schisms." For example, within "the green movement, more data-savvy thinkers (...) have become defenders of nuclear power, convinced by the data about climate change and energy systems that it may be essential" (6). In occasion of natural disasters, for example, "alternative" yet comprehensive, nuanced narratives can emerge from the group up thanks the analysis of novel datasets, including "emails, messaging, photo and video sharing, social media, user-generated maps, mobile phone tracking, mobile apps, vehicle Global Positioning System, security cameras, news articles, radio and television transmissions, commercial transactions, credit card history, traffic sensors, satellites, facial recognition, and census data" (19). For example, the integration of crowdsourced citizen data into humanitarian operations has engendered paradigmatic changes in traditional humanitarianism (Meier, 2015).

New epistemic cultures associated with "creating and warranting knowledge" [25] arise. By "making counter-discourses and data countercultures that challenge the mainstream readings of reality" [26], they mould the way we relate to knowledge and its validation, such as in the case of grassroots mapping practices (Gutiérrez, 2018b). For one, big data has reignited the old debate on data sources, prompting social actors to question their own trust mechanisms and to reclaim an active role — with consequences for, *e.g.*, work dynamics. In human rights activism, for instance, the "search for robust data, combined with our independent stand, forces us to a higher technological level" (1) Activists ask more frequently now "who is the origin of the data? On whom you depend to gather them? Our independence forces us to ask those tough questions. If we are independent, we need to be able to collect data independently" (1). Similarly, WikiLeaks has broken new ground in journalism, emphasizing "collaboration, data and verification", in contrast with commentary and opinion (17).

Tools — from desktop software to drones — are at the core of these novel epistemic cultures. A human rights organization no longer relies exclusively on eyes and ears or paper: while "fifty years ago, we used to receive two tons of information in printed paper", now citizens contribute digital data, or the organization generates data by itself, using, *e.g.*, satellite imagery, drones and social media (1). Slowly, critical perspectives on the "data revolution" emerge also within proactive data activists, by nature more prone to adopt hopeful narratives around big data. The dependence on software occasionally prompts practitioners to question the inner mechanisms of the machinery, for example issuing "new policies dictating when it is legitimate to use data gathered in this fashion and when it is a violation of individual rights" (1). In this respect, one may ask to what extent are these novel epistemologies and epistemic cultures distinct from the mainstream discourse on big data. Only a minority of our interviewees appears to challenge the positivist ethos of big data openly; most make it their own, however giving it a social change twist. This seems to be the "original sin" of proactive data activism, which explicitly emphasizes the possibilities for social change offered by big data and seeks collaboration and results as opposed to resistance and critique.

Self-empowerment: Skill acquisition and innovation

In earlier forms of engagement with technology, individual empowerment has been found to originate from community and co-creation dynamics, and first-person engagement with technology and content production in particular (Rodriguez, 2001; Milan, 2013). Similarly, engaging with data/infrastructure results in self-empowerment of the individual. Empowerment concerns the evolution of "a set of beliefs about the self in relation to particular activities" [27]. It manifests in narratives of self-transformation or novel sets of skills participants acquire through involvement in data-related activities.

In data activism, self-empowerment is linked to skill acquisition. Armed with the appropriate data skills, practitioners claim they can tackle social issues that are bigger than themselves (2, 5, 6, 12, 13). Some felt encouraged to deal with complex questions for the first time. Others declared that working with data opened opportunities to generate new business models, improving the impact of their projects. Acquiring data skills seems to make people more self-reliant. An interviewee decided to get trained in coding so to be more independent: "When we started out I was the content person and [name] was the tech guy [in our organization], but over time those roles blurred, and I learnt to code to a professional level. This has not only been great fun and intellectually stimulating, but it has also put me more in control of my working life" (6). Stretching it a bit further, data have the potential to provide autonomy to individuals "by supporting free, hive-like, horizontal communities, where knowledge is shared (...) A real digital public sphere" (17). In fact, for half of our sample, there is an explicit link between the use of data visualizations, reach and impact: on the one hand, individuals and organizations become more effective in communicating their knowledge (6), and on the other, data enable individuals to influence decision-making processes, as even individuals "now have (...) access to decision-makers" (12).

In sum, engaging with data/infrastructure empowers these pioneering communities to tackle social causes, be self-sufficient, increase their societal impact, produce new insights and generate transparency, find new business models able to sustain data projects, and even identify new exciting challenges.

Empowerment of others: Power redistribution and the democratization of knowledge

Activism is typically a "system of relationships" [28]. To complement our analysis of the individual outcomes of playing with data, we now turn to analyze the consequences on bystanders seen through the eyes of our interviewees. In other words, moving away from the micro level, we look at the effects of data/infrastructure at the meso level, investigating what practitioners perceive they do for others.

Engaging with data/infrastructure triggers an empowerment process that can alter authority dynamics, placing muscle in the hands of individuals of the lower levels of the power structure: "we want people to have easy tools to allow them to access real information and form their own opinions" (2). As if the awareness about the power behind data compelled activists to act responsibly to do "good", most interviewees believe big data affords power re-distribution. A comparable process has also been observed in earlier forms of media activism: as a low-power radio practitioner explained, "stealing the fire", like the demi-god Prometheus, "is a metaphor for the democratization of technology, for technology that is the servant of the political and social process of making decisions about our future" [29]. Similarly, ordinary people are empowered when they feel enabled to take action upon their own lives (9). The kind of insights that data/infrastructure can bring about can encourage individuals to navigate complex issues, especially if "a culture of data" is instituted to increase their ability to exercise democratic control.

Our interviewees advocate for the democratization of knowledge inherent in data/infrastructure. In the humanitarian sector, with data crowdsourcing, the beneficiaries of the data analysis can play an active role as data sources and analyzers. By factoring in masses of individuals (instead of just relevant samples of the population), epidemiology includes affected individuals in decision-making processes, with the goal to improve accountability processes with patients. This results in "an active, well-informed, participative population. It is putting epidemiology in the hands of people. By doing that, population medicine goes back to its roots in individual health, and it does so via the analysis of the accumulation of individual data, for the benefit of both the whole population and the individuals" (18).

Data can be a useful vehicle for engaging by-standers. In environmental activism, climate change visualizations have empowered activists to reach for the first time "big audiences, given how hard it can be to engage people on that topic" (6); similarly, an interactive map that serves as a monitoring and alert system in forests has reached one million people, contributing to raising awareness and facilitate advocacy against deforestation (12). In architecture, data/infrastructures contribute to putting people "at the center of the decision-making process of how constructions are designed and built" (9). Crowdsourcing personal data has taken center stage also in biodiversity conservation (12), and "crowdsourcing mobilization" breaks new ground also for human rights defense, generating participatory ways of obtaining data independently. It also increases the appeal of activism "for individuals who may not want to participate in traditional ways (...) we can facilitate participation, for example, asking individuals to be observers (and recorders) in demonstrations" (1). Furthermore, for half the interviewees, there is an explicit link between the use of effective data visualization, audience reach and impact. Engaging with data/infrastructure boosts the effects of collective action. Moving from describing how deforestation occurs in a year to show what is happening around forests now, facilitates enforcement and promotes real-time action (12).

Finally, transparency is believed to be the by-product of exploiting data. A co-occurrence analysis of our empirical material reveals a connection between generating impact, the insights data users come to, and the transparency data promote. One-third of the interviewees establishes a direct link between the usage of the data infrastructure in activism and journalism and an increase of transparency. A donor organization reports "opening up many sources of information never previously available," including parliamentary monitoring websites in different African countries (14). Data transparency also works as a powerful pressure mechanism, for example "when there was a critical mass of donors that had opened up their accounts, others followed suit because of the peer-pressure they felt", which helps to elevate "global standards for transparency in the donor sector" (16, *cf.* 13).

Conclusions

Analyzing the narratives and imaginaries of proactive data activists, this article explores how playing with data changes practitioners and their immediate communities. We identified six types of outcomes, affecting respectively work-lives, identities, tactics and tools, epistemologies, self-empowerment and empowerment of others. Building on and expanding SMS literature, we can group these into three broad categories: biographical, cultural and political, to reflect their consequences on individuals but also the society at large (see Figure 1). Although our sample embraces diverse fields of action (*i.e.*, epidemiology, journalism, architecture, campaigning, research), an archetypical story emerges: playing with data affects everybody at many levels, especially if individuals embrace the affirmative accounts associated with big data. The nature of these changes varies from the most profound (*i.e.*, a vision of the world) to the most tangible, *i.e.*, change in tactics and novel languages of engagement). The transformations affect both individuals (*i.e.*, patients included in decision-making processes in epidemic breaks) and organizations, which start to collaborate with others to confront complexity. Some of the changes are thickly entwined with other transformational processes, such as personal changeovers, while others happen more in isolation (*i.e.*, new business models around data projects).

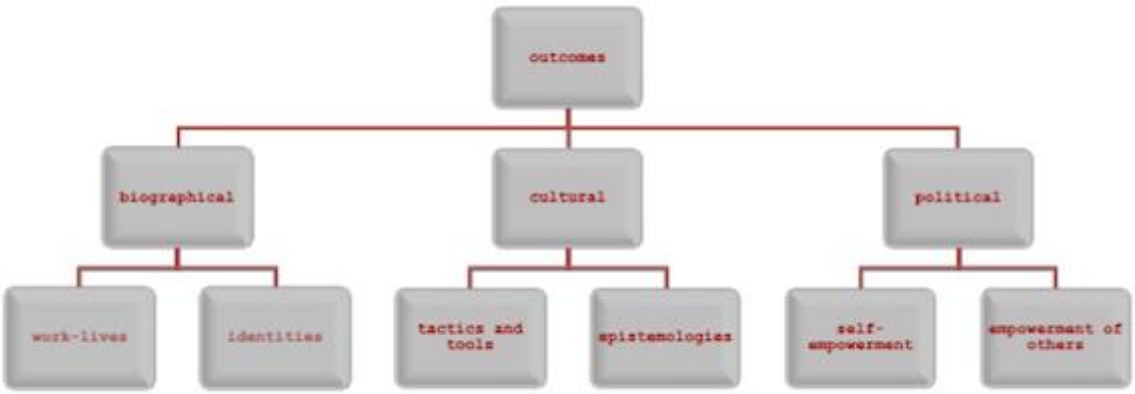

Figure 1: Types of outcomes.

Approaching data as practice and data activists as a pioneering community, we have seen how practitioners acquired new tools, modified their approaches, started to collaborate and create alliances, and found new ways to express and communicate intricate realities to broader audiences. They reportedly contributed to paradigm changes in their areas of expertise, altered their viewpoints and embraces complexity. They forged new epistemologies and carved new languages of engagement, whose relevance lies in their universality, the increased immediacy and efficacy. In so doing, they assumed the role of critical thinkers and mediators of innovation in the realm of data and technology.

All in all, with its hybrid, rummaging nature (Gutiérrez, 2018a), proactive data activism contributes to altering the everyday relations between citizens and data collection. Exploring the aftereffects of engagement with data on the practitioners themselves, exposing perceptions and skills, tactics, emotions of working with data as well as the facilitator role of data infrastructure, we helped to illuminate how datafication can potentially revolutionize digital activism. Data activists pioneer what is to be within digital activism, as the growing popularization of data and the data infrastructure has the potential to unleash

similar trends in other neighboring fields of action, opening new possibilities as well as bringing about novel challenges. But this emphasis within data activism on breaking new grounds and pioneering communities is also a reminder of the fact that datafication may in fact perpetuate and even accentuate existing digital divides within the civil society realm, excluding "those who lack access and expertise" (Zelenkauskaite and Bucy, 2016) and contributing to creating a new gulf between the "have" and "have not" of big data. Identity-building, theories of change, cross-fertilization of epistemologies and tactics as well as the aforementioned novel divides remain to be further investigated if we are to understand the magnitude and the boundaries of data activism and its impact on the contemporary movement ecology and society at large.

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Notes

1. Milan, 2017, p. 154.

2. Milan, 2017, p. 151.

3. Radjawali and Pye, 2015, p. 12.

4. Gitelman, 2013, p. 3.

5. Shiner, 2001, p. 19.

6. Braman, 2004, p. 4.

7. Hepp, 2016, p. 918.

8. *Ibid.*

9. *Ibid.*

10. McKelvey, 2014, p. 608.

11. Hepp, 2016, p. 919.

12. Couldry, 2012, p. 37.

13. Kubitschko, 2017, p. 5.

14. Giugni, 2004, p. 489.

15. Bosi, *et al.*, 2016, p. 3.

16. Gabrys, *et al.*, 2016, p. 12.

17. Choudry and Kapoor, 2010, pp. 1–2.

18. Kubitschko, 2017, p. 5.

19. Vestergren, *et al.*, 2017, p. 209.

20. Melucci, 1996, p. 71.

21. Rochon, 1998, p. 22.

22. Rochon, 1998, pp. 22–23.

23. Kitchin, 2014, p. 2.

24. Kitchin, 2014, p. 10.

25. Knorr Cetina and Reichmann, 2015, p. 873.

26. Milan and van der Velden, 2016, p. 63.

27. Drury, *et al.*, 2005, p. 310.

28. Melucci, 1996, p. 25.

29. Milan, 2013, p. 1.

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